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The Epidemiology of Walking for Exercise: Implications for Promoting Activity among Sedentary Groups

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ABSTRACT

The relative contribution of walking to overall leisure-time physical activity participation rates was studied among respondents from the 45 states that participated in the 1990 Behavioral Risk Factor Surveillance System (n = 81 557). The percentages of low income, unemployed, and obese persons who engaged in leisure-time physical activity (range = 51.1% to 57.7%) were substantially lower than the percentage among the total adult population (70.3%). In contrast, the prevalence of walking for exercise among these sedentary groups (range = 32.5% to 35.9%) was similar to that among the total population (35.6%). Walking appears to be an acceptable, accessible exercise activity, especially among population subgroups with a low prevalence of leisure-time physical activity. (*Am J Public Health.* 1995;85: 706–710)

Introduction

Evidence for the health benefits of regular physical activity has mounted in recent years,[1–6] and an increasing number of health-related organizations have advocated increased physical activity as a critical step toward a healthier population.[7–10] For several reasons, walking is of special interest in this regard. It is becoming increasingly apparent that light- to moderate-intensity activities such as walking may provide some of the same health benefits as do more vigorous types of physical activity,[10–13] along with a lower risk of injury and sudden death.[14]

Walking also has unique epidemiological features. First, walking is widely reported as the most popular form of physical activity.[15–18] Second, unlike most other leisure-time activities, particularly the more vigorous ones, walking for exercise has been shown to be as prevalent among people with low family incomes as it is among people with higher incomes.[16,19] The apparent preference for walking among persons of low socioeconomic status (SES) is of particular interest because low SES has been associated with decreased physical activity participation.[19–22] Based on this association, national health objectives for the year 2000

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This paper was accepted on September 27, 1994.

recognize persons with low income as a special population subgroup with a need to increase its level of physical activity.[23]

Previous reports of the apparent preference for walking among persons of low SES have lacked statistical adjustment for age, race, or sex. Using 1990 data from a large population-based survey, we sought to determine whether walking is an especially prevalent form of physical activity among demographic groups with high percentages of physically inactive people (e.g., low SES populations) when physical activity participation rates are adjusted for age, race, and sex.

Methods

Data Source

Data were analyzed from the 45 states (including the District of Columbia) that participated in the Behavioral Risk Factor Surveillance System in 1990. There were 81 557 total respondents.

Each year each participating state selects a random sample of its noninstitutionalized adult population (aged 18 or older) who have a telephone. Questions on the survey questionnaire primarily concern personal behaviors that increase risk for one or more of the 10 leading causes of death in the United States. The data are then weighted to the age-, ethnic group-, and sex-specific population counts from the most current census (or intercensal estimate) as well as the respondent's probability of selection. These weights are used to estimate state population prevalence rates. Further details about the purpose,[24] sampling method,[25] and method of analysis[26] of the surveillance system have been published previously.

Measurement of Physical Activity

With regard to physical activity, surveillance system respondents are first asked: "During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Those who answer yes are then given the opportunity to describe details (e.g., frequency, duration, distance) of the two types of leisure-time physical activity they spent the most time doing.

Analysis

PROC DESCRIPT from Survey Data Analysis (SUDAAN),[27] a statistical package for analyzing complex sample-survey data, was used to calculate prevalence estimates and their standard errors. The stratum-specific percentage of respondents who reported walking for exercise was calculated, as was the percentage who reported that they participated in any leisure-time activity for each of the following demographic variables: age (18 to 34, 35 to 54, 55 to 64, 65 to 74, and 75 or older); ethnic group (White, Black, Hispanic, or other); sex; employment status (currently employed, unemployed for less than 1 year, or unemployed for more than 1 year); and body mass.

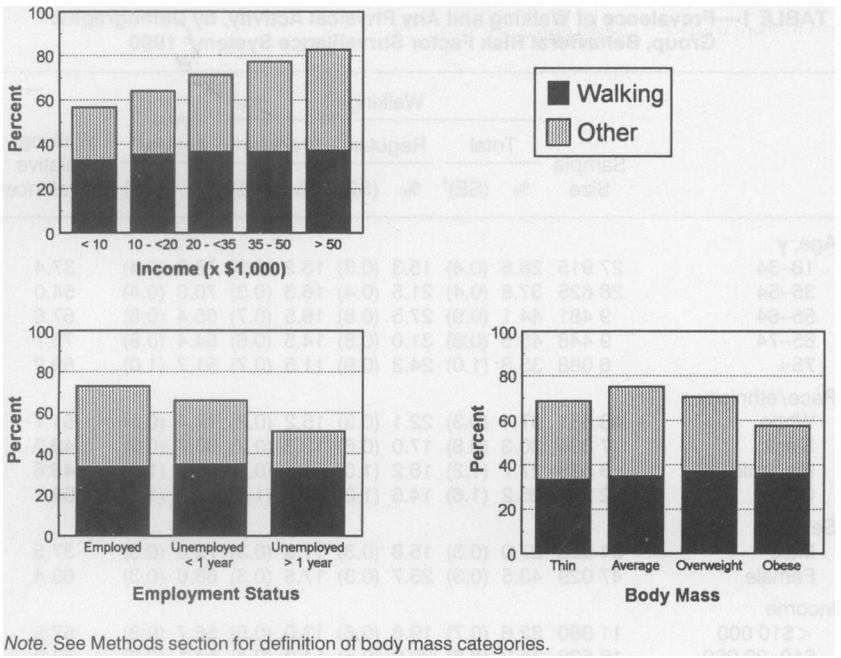
Body mass was classified as thin, average, overweight, or obese according to the following values of body mass index (weight in kilograms divided by height in square meters [kg/m^2]). For men, these values were under 20.0 kg/m^2, between 20.0 and 24.0 kg/m^2, between 24.1 and 29.9 kg/m^2, and 30.0 kg/m^2 and over, respectively. For women, the corresponding values were under 19.0 kg/m^2, between 19.0 and 23.0 kg/m^2, between 23.1 and 29.9 kg/m^2, and 30.0 kg/m^2 and over, respectively.[28] Homemakers, students, and retired persons were excluded from the analysis of employment status.

Persons who reported walking for exercise were categorized as either regular walkers (three or more sessions per week, 20 or more minutes per session) or irregular walkers (fewer than three sessions per week and/or less than 20 minutes per session.)[29]

TABLE 1—Prevalence of Walking and Any Physical Activity, by Demographic Group, Behavioral Risk Factor Surveillance System,[a] 1990

	Sample Size	Walking: Total %	Total (SE)[f]	Regular[b] %	Regular (SE)	Irregular[c] %	Irregular (SE)	Any Activity[d] %	Any Activity (SE)	Walking, Relative Prevalence[e]
Age, y										
18–34	27 915	28.5	(0.4)	15.3	(0.3)	13.2	(0.3)	76.2	(0.4)	37.4
35–54	28 625	37.8	(0.4)	21.5	(0.4)	16.3	(0.3)	70.0	(0.4)	54.0
55–64	9 481	44.1	(0.9)	27.5	(0.8)	16.5	(0.7)	65.4	(0.8)	67.6
65–74	9 448	45.5	(0.8)	31.0	(0.8)	14.5	(0.6)	64.4	(0.8)	70.7
75+	6 088	35.8	(1.0)	24.3	(0.9)	11.5	(0.7)	51.7	(1.0)	69.2
Race/ethnicity										
White	68 851	37.4	(0.3)	22.1	(0.3)	15.2	(0.2)	72.4	(0.3)	51.7
Black	7 834	30.3	(0.8)	17.0	(0.6)	13.3	(0.7)	60.7	(0.9)	49.9
Hispanic	3 523	27.7	(1.2)	16.2	(1.0)	11.5	(0.8)	60.8	(1.3)	45.6
Other	2 282	25.2	(1.6)	14.5	(1.2)	10.8	(1.1)	66.2	(1.8)	38.1
Sex										
Male	34 528	27.0	(0.3)	15.8	(0.3)	11.3	(0.3)	72.0	(0.3)	37.5
Female	47 029	43.5	(0.3)	25.7	(0.3)	17.8	(0.3)	68.6	(0.3)	63.4
Income										
<$10 000	11 380	32.6	(0.7)	19.6	(0.6)	13.0	(0.5)	56.7	(0.8)	57.5
$10–20 000	16 526	35.2	(0.6)	20.9	(0.5)	14.3	(0.4)	64.1	(0.6)	54.9
$20–35 000	21 057	36.4	(0.5)	20.9	(0.4)	15.5	(0.4)	71.4	(0.5)	51.0
$35–50 000	11 864	36.4	(0.6)	21.2	(0.6)	15.2	(0.5)	77.3	(0.6)	47.1
>$50 000	11 135	36.9	(0.7)	21.4	(0.6)	15.5	(0.5)	82.7	(0.6)	44.6
Employment status										
Employed	50 846	33.4	(0.3)	18.6	(0.3)	14.8	(0.3)	73.0	(0.3)	45.8
Unemployed <1 y	1 786	34.4	(1.8)	18.1	(1.4)	16.4	(1.4)	66.0	(2.0)	52.1
Unemployed >1 y	1 741	32.5	(1.8)	19.1	(1.5)	13.5	(1.2)	51.1	(2.0)	63.6
Body mass[g]										
Thin	4 520	33.1	(1.1)	17.3	(0.9)	15.8	(0.8)	68.7	(1.1)	48.2
Average	28 750	34.6	(0.4)	20.3	(0.4)	14.2	(0.3)	75.1	(0.4)	46.1
Overweight	36 811	36.7	(0.4)	22.1	(0.3)	14.5	(0.3)	70.5	(0.4)	52.1
Obese	11 476	35.9	(0.7)	20.5	(0.6)	15.4	(0.6)	57.7	(0.7)	62.3
Total	81 557	35.6	(0.3)	21.0	(0.2)	14.6	(0.2)	70.3	(0.3)	50.6

Note. Sample size totals vary owing to question-specific nonresponse.
[a]Includes 44 states and the District of Columbia.
[b]Three or more sessions per week, 20 or more minutes per session.
[c]Fewer than three sessions per week and/or less than 20 minutes per session.
[d]Persons who report having participated during the past month in any leisure-time physical activities or exercises such as running, calisthenics, golf, gardening, or walking.
[e]Relative prevalence of walking = prevalence of walking divided by prevalence of participation in at least one activity.
[f]Standard error of the mean.
[g]See "Methods" section for definition of body mass categories.



Note. See Methods section for definition of body mass categories.

FIGURE 1—Relative prevalence of walking compared with other activities, by income, employment status, and body mass.

To determine whether differences or similarities among group-specific participation rates could be accounted for by age, race, or sex, those variables were adjusted for by the direct method using the distribution of respondents to the 1990 Behavioral Risk Factor Surveillance System.

Results

Of the 81 557 total respondents, 70.3% (weighted) reported having engaged in some physical activity other than their regular job duties during the month before the interview (Table 1). Rates of participation in leisure-time physical activity decreased with age. Men were slightly more likely to participate than women, and Whites were more likely to participate than Blacks and Hispanics. Participation by members of other races was intermediate.

Persons at higher income levels were more likely to participate in some physical activity than were those at lower levels. Unemployed persons were less likely to participate than were employed persons. Obese persons were less likely to participate than were persons of average body mass; participation by thin persons and overweight persons was intermediate.

Of the 70.3% of respondents who reported at least some physical activity during the past month, approximately half (35.6% of the total sample) were walkers. In contrast to the large demographic differences in the percentages of people who participated in any physical activity, there was relatively little variation in the percentages of those who reported walking for exercise. For example, persons with a family income greater than $50 000 were much more likely to participate in some activity than were those with an income below $10 000 (82.7% vs 56.7%); however, the percentages of people in these groups who walked for exercise were much closer (36.9% vs 32.6%). Similarly, employed persons were much more likely to participate in some activity than were those unemployed for a year or more (73.0% vs 51.1%); however, the percentages of people in these groups who walked for exercise were nearly equal (33.4% vs 32.5%). Obese persons, even though they were less likely to participate in physical activity than were persons with lower body weight, were slightly more likely to walk for exercise than were thin persons and persons of average body weight.

More than half of persons who reported walking for exercise walked on a regular basis (three or more sessions per week, 20 or more minutes per session). Older walkers were more likely than younger walkers to walk on a regular basis; otherwise, the percentages of walkers who walked on a regular basis were quite similar among demographic groups (Table 1).

On a relative scale, walking for exercise was more prevalent among the more sedentary income, employment status, and body mass groups, reported by between 50% and 65% of those who exercised. By contrast, among the more active groups, less than 50% of those who exercised were walkers (Table 1, right-hand column; Figure 1).

The disparity between sedentary and more active demographic groups with regard to participation in any activity was accounted for largely by activities other than walking (Figure 1). Adjustments for age, race, or sex had no substantial effect on these results; most of the adjusted prevalences were within one percentage point of the unadjusted prevalences, and none differed by more than four percentage points.

Discussion

The results of this study underscore the prominence of walking among the many available forms of leisure-time physical activity: about half of all people who exercise during their leisure time walk for exercise, and the majority of those who walk for exercise do so on a regular basis. The relative prevalence of walking is highest among population subgroups that have the lowest prevalences of participation in leisure-time physical activity (e.g., low SES populations); the relative prevalence of walking for exercise among the most inactive subgroups remains high even after adjustment for age, race, and sex.

Advancing knowledge that light-to-moderate levels of physical activity confer health benefits constitutes an important "good news" health message. This message can be useful in countering the "No pain, no gain" mentality of the 1970s and 1980s, which may have discouraged many sedentary people from adopting such levels of activity.

In contrast to many exercise programs with dropout rates often exceeding 50% during the first few months,[30] walking has been shown to be a successful adherence strategy.[31] In a clinical trial among postmenopausal women, nearly 80% of 114 women aged 50 to 65 walked an average of 5 miles or more per week over a period of 2 years.[32] Thus, walking programs may prove to be more effective in promoting physical activity than pro-

grams with a more generic physical activity message. The relative effectiveness of efforts to promote walking over other types of exercise warrants study at the population level. Currently existing population-based surveillance systems, such as the Behavioral Risk Factor Surveillance System, could be used to evaluate such interventions.

Because of the current high population prevalence of walking for exercise, incremental increases in participation could markedly decrease the percentage of persons who engage in no leisure-time physical activity. For example, if half of all people who walk for exercise (about 35% of the adult population) were to bring along a companion who is currently not physically active, the percentage of people who get no leisure-time physical activity would decrease by more than half. For no other type of activity would such a modest incremental increase in participation have such a marked population impact.

Despite the relative absence of barriers to walking for exercise, barriers do sometimes exist. Lewis et al. identified lack of access, time, and safety as barriers to regular walking among a low SES population.[33] Hovell et al. showed that self-efficacy (e.g., confidence in one's ability to exercise when family or social demands are great) and the support of family and friends were associated with walking for exercise among sedentary subgroups[34] and with increased walking over a 2-year period.[35]

It remains uncertain to what extent physicians will accept the US Preventive Services Task Force's 1989 recommendation to counsel all patients to engage in regular physical activity.[10] In Missouri in 1990/91, only 15% of sedentary persons who had had a routine medical checkup in the previous year reported having been advised by their physicians to exercise more. Substantially more smokers (42%) and overweight persons (76%) reported receiving appropriate physician counseling.[36]

Our study is limited in that persons without a telephone and residents of six states (Alaska, Arkansas, Kansas, New Jersey, Nevada, and Wyoming) were not included in the 1990 surveillance system. However, more than 90% of households did have a telephone, and the states that were included in the survey represented more than 90% of the US population. Moreover, as in any survey, surveillance system data are subject to respondent error as well as to error associated with methods of data collection. But despite this, it is important to recognize that (1) no feasible alternative to surveys exists for collecting population-based information on physical activity, and (2) there is evidence that the validity of self-reported data on many health-related behaviors is quite good.[37]

The observed higher percentage of low-income persons who report that they engage in no leisure-time physical activity might overstate the association between SES and total physical activity if persons with low SES tend to be more active during the workday. Since the surveillance system survey does not include information about work-related physical activity, we are not able to test this hypothesis. Data from one study indicate that including work and household activities may offset some of the SES disparities among men but not among women.[38] In any case, with the growing mechanization of our society, leisure-time activities will clearly constitute an increasingly important component of total physical activity.

In pursuit of the nation's year 2000 health objectives for physical activity, we must promote a variety of types of activity. However, promotion of walking for exercise may currently be an underused tool, especially among population subgroups that have the highest percentages of inactive persons. Population-based evaluation of whether physically inactive persons may be more likely to begin and maintain walking for exercise than they are to begin and maintain other types of activity is warranted. □

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Young Maternal Age and Congenital Malformations: A Population-Based Study

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ABSTRACT

This study examined the prevalence of congenital malformations across the maternal age spectrum and identified specific malformation types that contributed to the overall prevalence among mothers under the age of 20 years. Data were derived from the California Birth Defects Monitoring Program for 1983 through 1988 live births. The distribution of prevalences of all nonchromosomal malformations was U-shaped across maternal age. Furthermore, several specific malformation types, representing nearly every organ system, were elevated among the infants of women under 20 years of age in comparison with those of women 25 to 29 years old. (*Am J Public Health.* 1995;85:710–713)

Introduction

Since the mid-1980s, pregnancy and birth rates among American teenagers have been increasing, with an estimated 11% of all women between the ages of 15 and 19 becoming pregnant, half of whom go on to deliver a live-born infant.[1,2] Few studies, however, have investigated the risk for congenital malformations among the offspring of teen mothers. This issue deserves attention, particularly given that low birthweight and infant mortality are outcomes for which infants of teen mothers are at high risk.[3] Congenital malformations are associated with low birthweight and are the leading cause of infant mortality in the United States.[4] Furthermore, factors suspected of playing a role in the etiology of some malformations such as poor diet, illicit drug use, and smoking may be more common during the pregnancies of young mothers than during those of older mothers.

The few investigations of congenital malformations among offspring of very young mothers have described a U-shaped curve for overall malformation rates across maternal ages.[5,6] These studies have been based on very small sample sizes, have relied on vital statistics malformation data, and have not described specific malformation types contributing to the pattern.

Using population-based registry data, we examined the prevalence of congenital malformations across the maternal age spectrum and attempted to identify specific types contributing to the overall prevalence of malformations among the youngest women.

Methods

Infants with congenital malformations were identified by the California Birth Defects Monitoring Program, a population-based congenital malformation registry with active ascertainment from multiple sources. Nearly all structural anomalies diagnosed before an infant's first birthday, including those diagnosed prenatally, are included in the registry.[7] Overall ascertainment has been estimated as 97% complete.[8] However, registry reportability procedures result in variable ascertainment for malformations

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This paper was accepted August 18, 1994.